

NC STATE UNIVERSITY

# nc state **ENGINEERING**

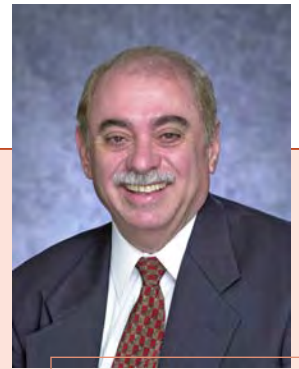


Spring 2008 • Engineering in the 21st Century: Energy + Environment 2



## From the Dean of Engineering

The past two years have flown by with many significant accomplishments in the College of Engineering. With support from the North Carolina legislature, we have been able to grow our faculty with significant new hires in critical areas of emphasis. We celebrated the groundbreaking of Engineering Building III, which will house our departments of Mechanical and Aerospace Engineering and Biomedical Engineering on NC State's Centennial Campus. And we look forward to working with the legislature to continue the growth of the college and improve opportunities for the people of North Carolina.



Louis A. Martin-Vega

These accomplishments have not gone unnoticed. In the latest *US News & World Report* graduate rankings, our college moved up four places to 30th place overall and 19th among public colleges of engineering. This is our highest rank since 2002 and the first four-place jump in more than a decade. This increase not only moves us closer to our ultimate goal of becoming “the leading public college of engineering in the nation,” but it also confirms that we have set the correct course to achieve that goal.

Thanks to the efforts of highly talented groups of faculty and staff, we are the lead institution on two National Science Foundation (NSF) Engineering Research Center (ERC) proposals being considered for funding. ERCs are the largest and most prestigious research awards funded by the NSF. The Future Renewable Electric Energy Delivery and Management (FREEDM) Systems ERC, led by Dr. Alex Huang, brings together researchers to solve future challenges to our energy grid. The Innovative Fibrous Systems ERC, headed by Dr. Behnam Pourdeyhimi and Dr. Ruben Carbonell, focuses on the creation and development of future fiber-based solutions for a range of critical human needs from medicine to homeland security. We are also a partner institution on a third NSF ERC proposal with the University of Miami where the work of Dr. Sami Rizkalla and his colleagues in our Constructed Facilities Laboratory plays a key role.

The Meet the Dean events continue to be important avenues for connecting us with our alumni across the nation. We met with alumni in Chicago in December and traveled to Florida in January, meeting with alumni in Orlando and Tampa and at Harris Corporation in Melbourne. In February we met with alumni at SAS in Cary, NC. We are grateful to those who hosted these events and look forward to continuing our efforts to share our vision and promote better communication and community among our alumni.

Chancellor Oblinger has proclaimed 2008 the “Year of Energy” at NC State. In fitting with this proclamation, we continue our fall theme of Energy and the Environment in this spring issue of *NC State Engineering* magazine. Our faculty and students are developing new technologies for hybrid vehicles, alternative fuels, energy-saving devices, cleaner air and water, better prosthetics and lighter, stronger materials. Our student groups are working in other countries to bring safe drinking water to villages, our motorsports team is competing using ethanol fuel, and our alumni are helping provide our students with work in environment-related industries. In the following pages you will read about these efforts and other ways we are “engineering a better tomorrow.”

We take great pride in these accomplishments and see them as a reflection of the quality of our college. Truly we can look back and see that we have not just stated a goal but embraced it and taken significant strides toward achieving it. It takes a diverse and dedicated team of faculty, students, staff, administrators, alumni, friends, legislators and citizens to achieve greatness. The College of Engineering is most fortunate to have such a team working toward a better future for us all.

Thank you for your support and all that you do on behalf of our students, faculty and staff. I look forward to working with you to achieve our goal, and I hope that you enjoy this issue of *NC State Engineering*.

– Louis A. Martin-Vega  
Dean, College of Engineering

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### About the Cover

Dr. Rajendra Pachauri, industrial engineering alumnus and chairman of the Intergovernmental Panel on Climate Change (IPCC), and former Vice President Al Gore enjoyed the celebration honoring them as recipients of the Nobel Peace Prize in December 2007. Pachauri has worked for 30 years on protecting the environment. His accomplishments and recognition illustrate how engineering alumni influence our world. (Photo: Getty Images)

## nc state engineering

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or send address corrections to NC State Engineering Foundation Inc. at the address above,

or call 919.515.7458, toll free: 866.316.4057

## College breaks ground for new Centennial Campus building

Engineering Building III is going up.

A groundbreaking ceremony for the new building on Centennial Campus was held Feb. 27. The building is the future home of the Department of Mechanical and Aerospace Engineering and the Joint Department of Biomedical Engineering.

The building is scheduled to open in August of 2010, representing the third phase of the plan to move the College of Engineering to Centennial Campus. When finished, the building will have 248,000 square feet of classroom, laboratory and office space. Once EBIII is occupied, two-thirds of the College of Engineering will be located on Centennial Campus.

## Johnson begins Progress Energy Distinguished Speakers Series

Steven Berlin Johnson, a noted author, social critic and technologist, kicked off “Solving. Evolving. Engineering: The Progress Energy Distinguished Speakers Series” (SEE) in March. The series, which will continue this fall, was created to foster dialogue around engineering’s capacity to solve some of the world’s greatest challenges.

Johnson is a contributing editor to *Wired* magazine and a Distinguished Writer In Residence at the New York University Department of Journalism. He has been named by *Newsweek* as one of the “Fifty People Who Matter Most on the Internet.”

The series was made possible by Progress Energy, a Fortune 250 company based in Raleigh that serves more than 3.1 million customers in the Carolinas and Florida through its two major utilities. The company has been a longtime supporter of the College.

## “Leadership in Technology” Speakers Series continues in 2008

As part of its 40th Year Celebration in 2007, the Department of Computer Science launched its Fidelity Investments “Leadership in Technology” Executive Speakers Series.

The series was made possible for the 2007–08 academic year by a generous gift from Fidelity Investments.

The department hosted three speakers during the spring semester: Douglas M. Balog, vice president of IBM Modular and Blade Systems Development, on Jan. 29; Bob Young, founder and CEO of Lulu.com, on Feb. 26; and Tom Mendoza, president of Network Appliance, on April 10.

## NC State launches Secure Open Systems Initiative

The College of Engineering celebrated the establishment of the new Secure Open Systems Initiative (SOSI) on Centennial Campus in April. This initiative, funded with help from Congressman David Price, will be led by Dennis Kekas.

SOSI was created as a result of close collaboration between NC State’s Networking Technology Institute and several outside participants, particularly the Army Research Office and open-source giant Red Hat, which has its corporate

headquarters on Centennial Campus. Research conducted through SOSI will make vital computer systems more secure.

NC State has played an important role in the growth of open source systems. More than a dozen faculty members have been focusing research on open-systems-related software security, network security, software engineering, and new networking technologies.

“Cyber-security has become a top priority,” said Congressman Price. “We’ve got to be more pro-active in protecting our infrastructure. If we can identify threats to national security, then we can stop or mitigate the danger.”

## Ten graduate online degree programs now available

Engineering Online has added new online graduate degree programs in nuclear engineering and materials science and engineering, bringing the total number of graduate online programs to ten. Other online graduate degree options include civil engineering, computer science, aerospace engineering, chemical engineering, computer engineering, electrical engineering, mechanical engineering, and a master of engineering degree. These degree programs are exactly the same as the on-campus non-thesis programs in terms of requirements and academic rigor.

The Engineering Online program at NC State has been named a best value for online engineering degrees and offers several graduate courses each semester that can be taken by nontraditional students for professional development or towards the completion of an online degree program.

For more information, contact the Engineering Online office toll-free at 877.254.0058 or 919.513.4481. Information about the program is also available on the Web at <http://engineeringonline.ncsu.edu>.

## College moves up in rankings

The College of Engineering at North Carolina State University ranked 30th among the nation’s engineering schools in annual rankings of graduate programs published in March by *U.S. News & World Report*. It was the highest ranking for the College since 2002. The College ranked No. 34 last year.

Among public colleges of engineering, the College ranked 19th, up from 20th last year.



Engineering Building III will have 248,000 square feet of classroom, laboratory and office space.



# NC State engineer helps fuel hybrid bus movement

Ewan Pritchard wants to transform the school bus market.



Ewan Pritchard, a doctoral student in mechanical engineering, stands under a painted blue sky in Wake County's plug-in hybrid school bus.

The big yellow school bus drops the kids off at school and returns to the bus yard for a few hours of rest before the afternoon run.

Then it does something unique among Wake County school buses: it plugs in.

The bus—which runs on diesel and an electric battery—is part of a growing movement among school districts to cut down on gas costs while helping the environment. Spurring it on is Ewan Pritchard, a doctoral student in mechanical engineering who helped develop the hybrid plug-in technology.

“The plug-in hybrid kind of gives you all the benefits of the electric vehicle as well as the reliability of both systems added on to one another,” he said.

Pritchard dates his fascination with hybrids to the 11th grade at Raleigh's Enloe High School. He wasn't a very good student at the time, but when he was assigned a project on alternative-fueled vehicles, the hybrid bug bit him. He got his grades up and decided he wanted to spend the rest of his life working on new ways to power cars and trucks.

“It was like a light switch,” he said. “I mean, it just flipped.”

So Pritchard headed to NC State, eventually getting bachelor's and master's degrees in mechanical engineering. His master's thesis examined the possibilities of the plug-in hybrid school bus, finding that school districts could save money and cut

Right: Pritchard works for Advanced Energy, a company on Centennial Campus that's trying to bring hybrid buses to more schools.

Below: The bus, which runs on diesel and an electric battery, plugs in at the Wake County bus yard.

emissions by using them. He estimates that such buses can achieve a 95 percent increase in fuel economy for the first 45 miles of a trip, with a 40 percent improvement the rest of the way. School buses usually average between 50 and 150 miles per day.

It takes money and energy, of course, to recharge the buses' batteries. But in the end, Pritchard notes, the cost of electricity is equal to a gallon of fuel that costs 60 cents.

These days, Pritchard is pursuing his doctoral degree and working for Advanced Energy, a non-profit on Centennial Campus that is working with governments in several states to bring hybrid buses to more schools. To date, 13 buses have been delivered, and several more are on the way.

Sponsors of the project include Duke Energy, Progress Energy and the New York Power Authority. At NC State, Pritchard is working with Dr. Mo-Yuen Chow in the Department of Electrical and Computer Engineering; Dr. Chris Frey in the Department of Civil, Construction, and Environmental Engineering; and Dr. Rich Gould in the Department of Mechanical and Aerospace Engineering.

Eventually, Pritchard and the company want to demonstrate the successful operation of an entire fleet of plug-in hybrid school buses. Adding heft to the plan is International Truck and Engine, the largest bus manufacturer in North America, which is producing the hybrid buses. And while auto manufacturers are promising plug-in models in the next few years, Pritchard said, the plug-in school bus is available today.

"We fully believe," Advanced Energy's website reads, "that (the) final phase of the project will complete the transformation of the school bus market so that all new school buses will be plug-in hybrids." ■



# The sunny side of energy



Dr. Gregory Parsons uses nanotechnology to transform the way we use energy.



Left: Undergraduate researcher Michael Stewart works in Parsons' laboratory.

Above: Dr. Gregory Parsons leads the NC State Nanotechnology Initiative, which seeks to coordinate nanotechnology research across the university. Many see such research revolutionizing renewable energy.



If humans could use sunlight to power cars, homes and businesses, we wouldn't need fossil fuels.

But first, we need better solar cells, says Dr. Gregory Parsons. And they must appeal to thrifty consumers.

"Right now, you can go buy solar cells, but they're very expensive," Parsons said. "You want to be able to make them cheaper."

Parsons, professor of chemical and biomolecular engineering at NC State, is studying ways to cut the costs of solar cells and make them more efficient. Among his projects: developing a photovoltaic device that can control how electric charges are transferred. The charges typically lose some of their energy at those junctions, and Parsons wants to eliminate that energy loss.

The research is important because more and more people will seek out solar energy to power their lives over the next half-century, Parsons predicted.

"You need the basic technology now in order to meet the demand that's going to be out there in 30, 40, 50 years," he said.

Parsons also leads the NC State Nanotechnology Initiative, an interdisciplinary group that coordinates nanotechnology research across the university. Parson's initiative will expand team-building among researchers and build partnerships with local companies, as well as help researchers land bigger grants.

Many see the small-scale science—a nanometer is about 1,000 times smaller than the width of a human hair—revolutionizing pharmaceuticals, computers and countless other areas, including renewable energy.

So instead of waiting for others to develop better energy technologies, Parsons said, "I think our state should be thinking about homegrown solutions to the energy problem." ■

## Wolfpack Motorsports gives students experience working with alternative fuels



For Dr. Eric Klang and the Wolfpack Motorsports team, nothing matters more than performance. But when a chance came to increase their car's performance that also made the car more environmentally friendly, the team embraced the opportunity.

Klang, the faculty advisor for the team, said that he and his students have been researching and racing with ethanol fuels for several years now. The advantages offered by ethanol were the main reason why the team decided to use the fuel.

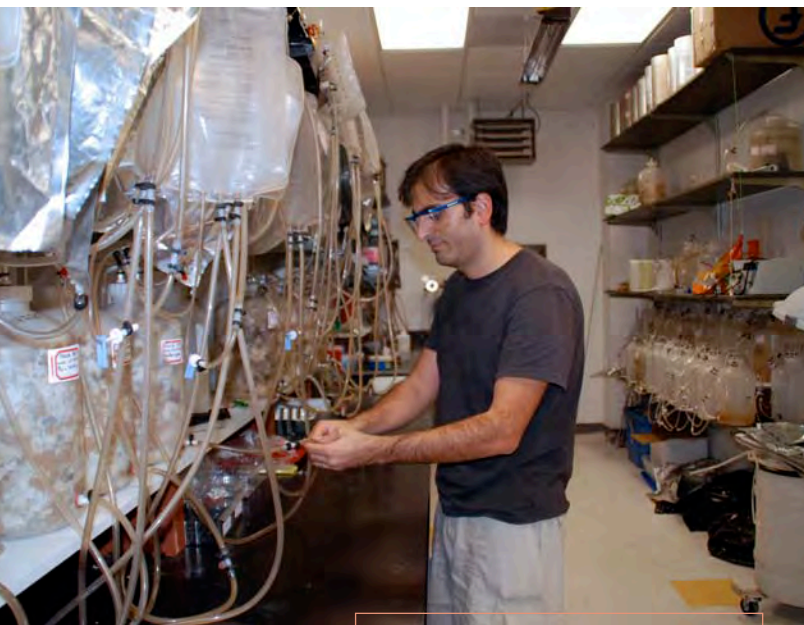
"We turbocharged our engine, and ethanol offers better cooling. We were doing it for performance. We weren't doing it to save the world, but that has been a good by-product, and we now use 85 percent renewable energy," said Klang, associate professor of mechanical and aerospace engineering.

Klang said that giving students an opportunity to work with alternative fuels would help them in the future.

"For my students, it's no big deal to work on this engine. That's what they gain, is the confidence to work on an engine to run different fuels. Who knows what tomorrow's fuel will be?"

# Learning about landfills

Improving the way landfills  
break down trash helps  
the environment—and  
saves money.



Pascal Saikaly, above, works with Dr. Morton Barlaz to better predict how waste will decompose in bioreactor landfills.

Many people give little thought to all that office paper and extra plywood rotting away in landfills.

But Dr. Morton Barlaz sees ways to help the environment—and save money. His research aims to better predict how waste will decompose in bioreactor landfills, a new type of landfill in which waste biodegradation is accelerated by recirculating water through the waste. Figuring out how fast trash decomposes will improve how landfills are designed and operated.

“Anybody that makes a capital investment in anything wants predictability,” said Barlaz, professor of civil and environmental engineering at NC State. “And landfills are no different.”

The research, conducted with engineers at the University of Wisconsin-Madison, recently received funding from the National Science Foundation (NSF). The process was competitive, as the NSF received 246 grant proposals and recommended funding only 15. The NC State/Wisconsin group is getting \$600,000 for three years.

The research has attracted a broad array of partners, including the U.S. Environmental Protection Agency, the National Solid Waste Management Association, and local governments that have agreed to let researchers bury samples in their landfills. Researchers will study the samples, composed of paper, lumber and other materials, to see how they break down.

If the research helps improve waste decomposition, that frees up space for more garbage at existing landfills and reduces the need for new ones. And as garbage breaks down more quickly, it produces more methane gas that can be converted to energy, reducing the need to get energy from other sources.

And since residents pay for landfills through fees or property taxes, making them more efficient carries pocketbook benefits.

“Anything we do to operate these facilities better and understand them better helps us get more energy from waste in the most economical way possible,” Barlaz said. ■

Dr. Alex Huang focuses his research on power electronics, technology that converts power into a form consumers can use.

# Power-packed research

Alex Huang wants to improve the nation's power grids—and prepare them for the future.

Someday in the not-too-distant future, a wealth of electricity generated by sunshine and wind will stand prepared to flood the nation's power grids.

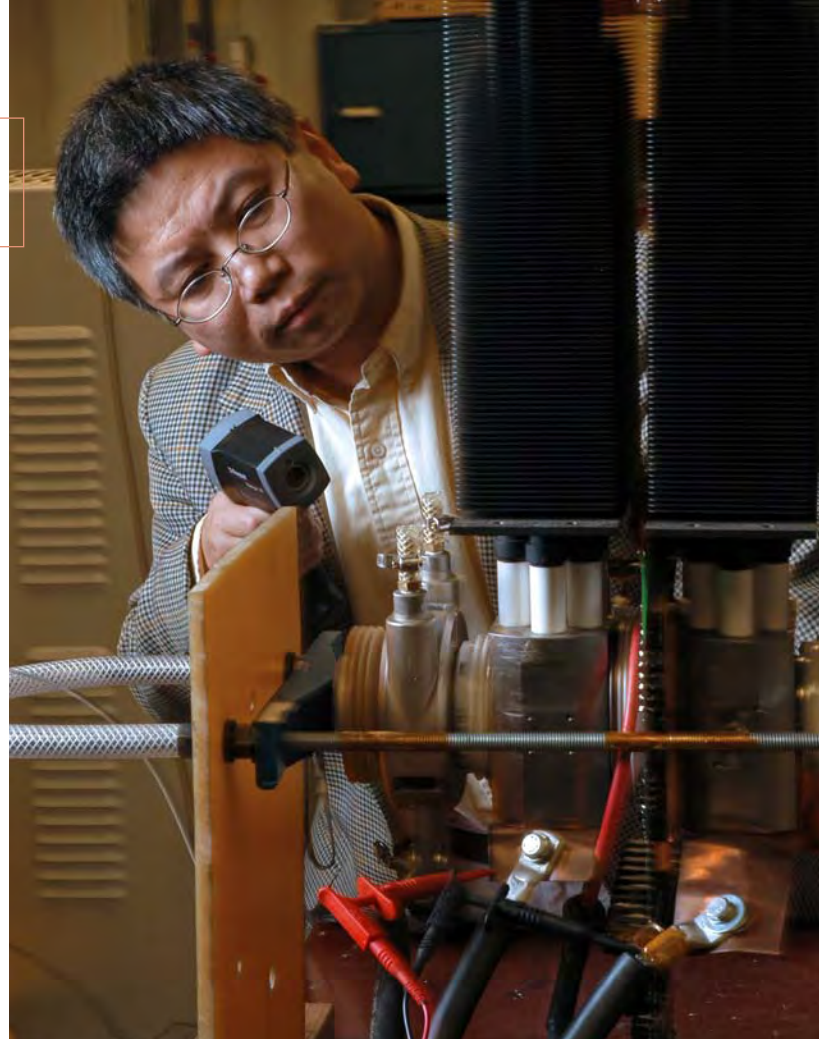
Dr. Alex Huang wants the grids to be ready.

Huang, the Progress Energy Distinguished Professor in Electrical and Computer Engineering, directs the Semiconductor Power Electronics Center (SPEC), a research group on Centennial Campus that wants to boost the capacity of existing power grids and integrate them with renewable energy sources such as solar and wind. Developing this technology is difficult; the giant grids handle millions of watts of power.

“For a university to do experimental research in this area is not easy,” Huang said. “And NC State is a leader in this area.”

Huang's work focuses on power electronics, technology that converts electric power into a form that consumers can use or that can be injected into the grid. Power electronics can enable grids to carry more power so utilities get the most out of their existing transmission-and-distribution infrastructure.

The group is also looking at ways to move alternative energies onto the grid. SPEC is working with a utility in Oregon to integrate wind-produced power into the network using Emitter Turn-off Thyristor (ETO) technology, which improves the speed and efficiency of power electronics systems. The technology, developed in the past several years with support from



the Department of Energy and a number of utilities, can switch on and off at megawatt levels at 1000 times per second. Last year SPEC also became the first group to demonstrate a silicon-carbide-based ETO device that can potentially switch 10 times faster than silicon ETO.

Huang also looks ahead to a day when hybrid plug-ins—vehicles running on gasoline and batteries that plug into power grids—might be widely used. His team is looking to develop electronics that operate at higher temperatures for vehicles and examining ways to manage a power grid unaccustomed to lots of charging and discharging cars.

Huang will be a key player in the Advanced Transportation Energy Center, which will conduct research to advance more widespread use of plug-in hybrid vehicles. North Carolina Governor Mike Easley announced the creation of the new center in February; it will be located on Centennial Campus.

“This is a totally new challenge and new opportunity,” Huang said. “And you need power electronics and information technology to manage it.” ■



# Lightweight metal foam could help save lives



The metal foam invented by Dr. Afsaneh Rabiei can be used in vehicles, armor and biomedical devices.

It's lighter than steel. It's stronger than steel foam. It's a composite so revolutionary that it can absorb the energy and shock it encounters at a rate up to 80 times higher than bulk steel, even though that steel is three times as dense.

Dr. Afsaneh Rabiei, associate professor of mechanical and aerospace engineering, has invented a new ultra high-strength composite metal foam to satisfy the growing need for lightweight materials with great strength and energy-absorbing capacities. This new material, which far outperforms other metal foams, can be used in vehicles, armor, structural support and even biomedical devices. It has the capacity to minimize damage from explosions, improve gas mileage and save lives.

"We have a much higher strength compared to any metal foam that has been made," Rabiei said.

The main weakness of existing metal foams is their varying porosity sizes. Rabiei, however, used hollow metal spheres of standard sizes and combined them with a metallic matrix to support the cell walls. In so doing, the composite metal foam has much higher strength-to-density ratio than any other foam, much lower density than bulk metals and much higher energy absorption than either. The National Science Foundation is sponsoring the research.

Used in the front ends of trains, planes and cars it could mitigate impact damage. According to Rabiei, rough traffic accident calculations show that two pieces of this composite metal foam in the bumper of a car traveling 28mph upon impact would feel the same to passengers as impact traveling at only 5mph.

"Basically," Rabiei said, "it is a new material for all sorts of safety devices." ■

# Alumnus wins Nobel Prize, returns to NC State

Dr. Rajendra K. Pachauri returned to NC State in February, two months after receiving one of the world's most prestigious awards.

Pachauri, a College of Engineering alumnus, accepted the Nobel Peace Prize on December 10 as chairman of the Intergovernmental Panel on Climate Change (IPCC), a group of scientists that assesses humans' impact on global climate. The IPCC shared the award with former Vice President Al Gore.

A delegation from NC State met with Pachauri in India at the headquarters of The Energy and Resources Institute, (TERI) in early December. TERI is a non-profit environmental research group. Pachauri is its director-general.

"I am happy to be able to say hello to my old friends," he said at the time, emphasizing that he looked forward to discussing the institutions' shared interests.

Pachauri returned to NC State for the 2008 Emerging Issues Forum, where he spoke about the science of global climate change and the threat to human health and the environment.

Also, Pachauri was honored at a special event Feb. 11 and was presented with a 2007 Distinguished Alumnus Award from the Edward P. Fitts Department of Industrial and Systems Engineering for his contributions to his profession, the community and the university. The event was sponsored by the department, the College of Engineering and the NC State Graduate School.

Pachauri earned his master's degree in industrial engineering in 1972 and a joint Ph.D. in industrial engineering and eco-

Dr. Rajendra K. Pachauri returned to NC State in February, where he accepted the Distinguished Alumnus Award from the Edward P. Fitts Department of Industrial and Systems Engineering.



nomics in 1974—both at NC State. He served as an assistant professor and a visiting faculty member in the Department of Economics in the 1970s.

He was nominated for the *TIME Magazine's* list of 100 Most Influential People in the World in 2007. ■





Engineering students last fall built shacks and raised money for Habitat for Humanity.



## Shacking up for a good cause

Engineering students help raise money for the poor.

“Spare change for Habitat?”

Those words were repeated all over the Brickyard last fall as dozens of students circulated among their peers collecting donations in buckets, cups and, in some cases, bright red shoes.

The popular gathering ground at NC State was transformed into a village of shacks for an entire week as part of an effort to eliminate inadequate housing in Raleigh and beyond.



It's called Shack-a-Thon. Sixteen student organizations built shacks on the Brickyard and lived in them for a week while they panhandled passersby for money, competing to see which group could raise the most for Habitat for Humanity.

The groups got creative, raising money through spin-the-wheel giveaways, kissing booths and a water-balloon toss—where a dollar bought a potshot at campus dignitaries like Provost Larry Nielsen.

“Seeing creative shacks and games that the other student organizations come up with each year and how many people are sleeping on the Brickyard all night lets you know how many people enjoy this event,” said Matt Poisel, a senior in civil engineering and a works project officer for the campus Habitat chapter. “Shack-a-Thon has evolved into more than a fundraiser, now it seems like it’s a part of campus tradition.”

The fundraising goal this year was \$25,000, and the event brought in nearly \$25,900—every penny of which goes to Wake County Habitat for Humanity to help fund a house for a local family.

The event has blossomed over the years, from one shack back in 1993 to the 16-shack block party that it is today. Organizers try to make it bigger and better each year.

“I think it does a lot for the students,” said David Hoffman, a junior in civil engineering and works project officer for the campus chapter. “It gives them a chance to interact with other organizations on campus, mainly because a lot of groups tag-team with each other to fund and manage the shacks. But also because every group is out there for the same good cause.”

The experience and dedication show. The campus chapter builds at least two entire houses in Wake County each year. Said Poisel, “Walking through the neighborhoods we work in and seeing all the kids playing makes it feel like you’re helping to build an entire community with even the smallest donation.” ■

## “Geek-a-Thon” helps bring technology to less fortunate



October 5, 2007 was a proud day for geeks on the NC State campus.

Students from the Association for Computer Machinery, Association for Information Technology Professionals and Women in Computer Science put their skills to good use, volunteering their time to help refurbish old computers for disadvantaged middle school students in the area.

The event, which took place at Centennial Campus Middle School (CCMS), was part of a partnership between the Department of Computer Science and the middle school. About 40 of the 250 refurbished computers from the event went to CCMS students. The event also received support from N.C. Chapter of the Society for Information Management, The Pantry/Kangaroo Express, Cisco Systems and the Raleigh Chapter of Information Systems Security Association.

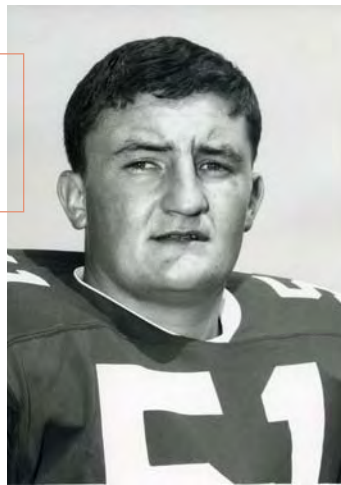
The first Geek-a-Thon was held in 2005 by the Kramden Institute Inc., a Research Triangle-based non-profit group. The 2007 event was the first Geek-a-Thon to be coordinated by a group from outside the institute. The Department of Computer Science organized the 2007 Geek-a-Thon as a part of its 40th-year celebration.

“Bringing together members of the ‘geek’ community to help less fortunate students in our community, especially during their middle school years when career interests are being formulated, could have a significantly positive impact on these kids’ lives and the community at large,” said Ken Tate, director of development and external relations for the department.

# Engineering turnarounds

Nuclear engineering graduate John Norris has built a dynamic business career.

Norris played center for the NC State football team from 1967-70; today he is CEO of Fuel Tech.



John Norris has turned around flagging companies and landed on the cover of *Fortune Small Business* magazine. He's a CEO now, but he's an engineer first.

"Sometimes things in business and life can come at you and overwhelm you if look at the whole picture," said Norris, who earned a bachelor's degree in nuclear engineering at NC State in 1971. "But engineering teaches you to break down problems to bite-sized issues that can each be solved in a logical way."

Norris has adopted that attitude during a successful business career that saw him rise through the ranks at Duke Energy before assuming the top job at Illinois-based Fuel Tech, a \$75 million company that produces technologies and chemicals to help power plants run cleaner. Amid the global fight against air pollution, demand for Fuel Tech's business is growing.

"We are now in the midst of the strongest surge of new business in the company's history," Norris said in a December press release.

Norris landed at NC State on a football scholarship—he played center—but he was impressed that the university had an on-campus nuclear reactor and was considered a leader in nuclear technology.

After graduation, he spent a decade in the Air Force before joining Duke Energy's nuclear power program in 1982. He was running Duke Engineering and Services seven years later, boosting the unit's revenues from \$7 million in 1989 to \$425 million in 1997. Norris left Duke in 1999 to work at companies in Texas and Ohio, building his reputation as a turn-around specialist before joining Fuel Tech in 2006.

Fuel Tech was already growing fast when *Fortune Small Business* showed up last year wanting to do some interviews. But Norris had no idea that the company would be ranked No. 12 on the magazine's FSB 100, or that Norris himself would land on the cover, until another Fuel Tech executive called him.

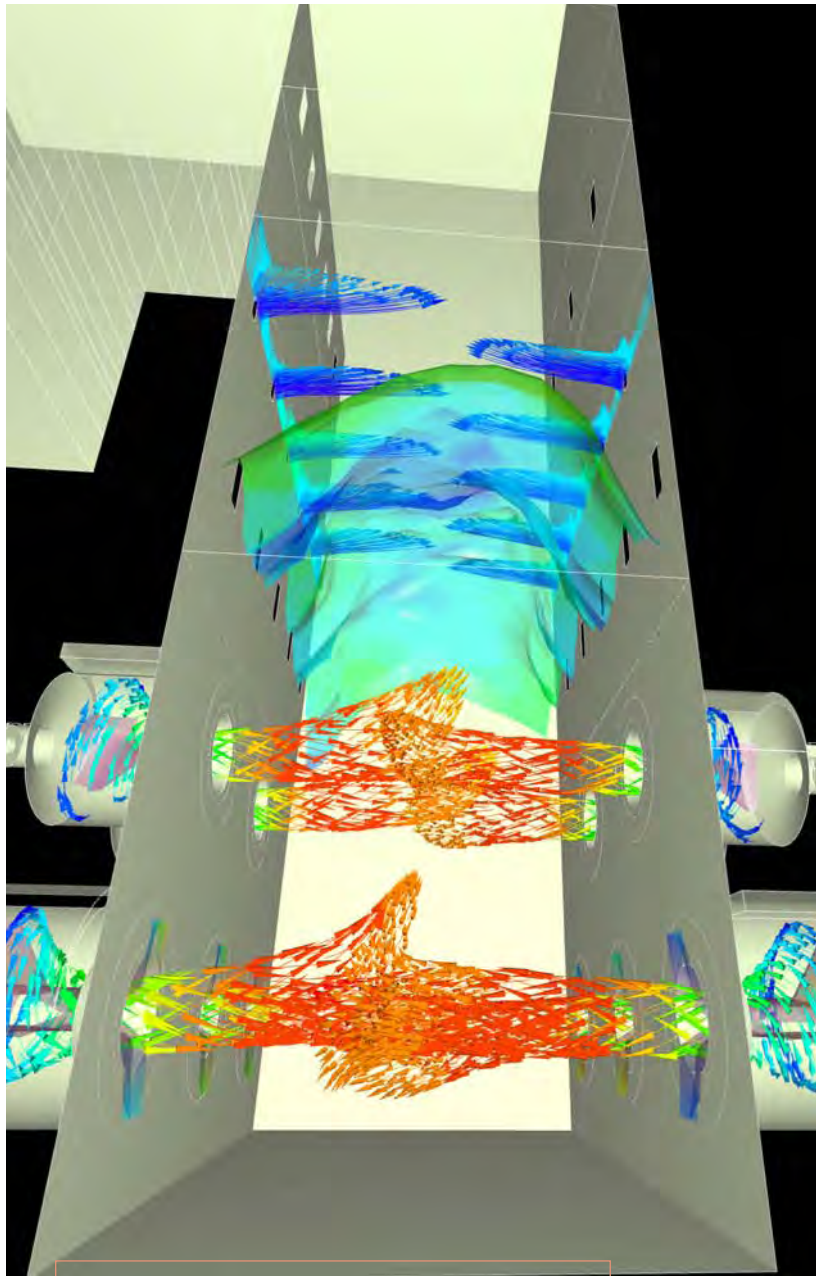
"Oh my gosh, we made the cover!" Norris remembered her saying. He added, "It was a pretty neat moment."

The story prompted more interest in Fuel Tech's stock, Norris said, but the company's success has much more to do with its innovative way of cleaning up power plants.

The Mexican state utility, for example, hired Fuel Tech amid concerns that sulfuric acid emissions from a power plant were creating serious health problems at a nearby resort. Fuel Tech installed technology that injected just the right amount of chemicals into the plant, and the problem was fixed. Late last year, Mexican President Felipe Calderon presented Fuel Tech and its partner on the project with Mexico's highest award for technological innovation.

Norris sees more bright days ahead for Fuel Tech. But he looks back fondly on the relationships he built as a football player and engineer at NC State.

"They are dear to me today," he said, "and have shaped my life in many ways." ■



Fuel Tech's virtual reality models help engineers figure out how to reduce nitrous oxide emissions at power plants.



# Building bones

Dr. Elizabeth Loba wants to give injured patients new bone and cartilage. She's starting with their own stem cells.



Researchers in Dr. Elizabeth Loba's lab are studying ways to build bone and cartilage from stem cells.

Some are war veterans who have lost limbs on the battlefield. Others are aging baby-boomers aching from osteoarthritis. Still others are children with skeletal defects.

They're all in Elizabeth Loba's head. She wants to help them get back what they've lost, or what they never had, by coaxing stem cells to become bone or cartilage.

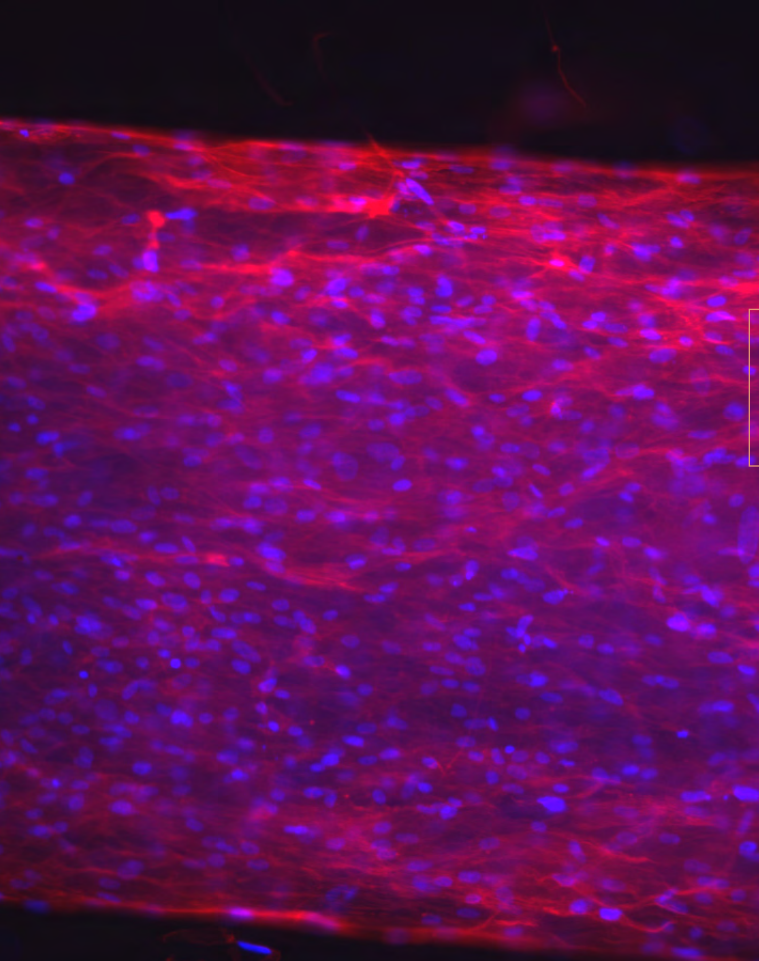
"For me, it is particularly rewarding to think about work that's going to be done that will help children or wounded soldiers," she said. "How can you not feel good about the potential to do something good there?"

Loba, an assistant professor of biomedical engineering, has built a career studying ways to build bone and cartilage outside the body that withstands the inside-the-body rigors of daily life. Stem cells taken from patients through liposuction (a fat removal procedure) give her team an accessible, plentiful source of bone-growing material.

"When you use a patient's own cells, you don't have any immune response. You don't have any limited donor tissue," she said. "You've got a large resource."

A big breakthrough came in 2005, when Loba's team, in collaboration with Dr. Carol Otey at UNC-Chapel Hill, became the world's first to prove that palladin, a protein that is part of a cell's "skeleton," is present in mesenchymal stem cells found in bone marrow. The discovery is leading to more clues on how stem cells can build bone.

Other researchers are taking notice. In 2007, the N.C. Biotechnology Center awarded Loba's team a \$250,000 grant



Loboa wants to know more about how adult stem cells hold up under strain. In this image of strained cells within a collagen gel, red shows the cell cytoskeleton and blue shows cell nuclei.

to study the role palladin plays during differentiation of stem cells into bone cells and palladin's function in the response of stem cells to the types of mechanical load they would typically experience inside the body. Loboa recorded some of her work on palladin that summer in the *American Journal of Physiology–Cell Physiology*.

Her team includes about a dozen graduate and undergraduate students, all of whom share her affinity for helping people. As a child, doctoral student Wayne Pfeiler watched his younger sister struggle with spina bifida, a birth defect that prevented her from walking. He spent lots of time in hospitals and medical offices, peppering doctors with questions about the wheelchairs and braces she used to get around.

“That got me interested in what science can do to help people who have injuries or disabilities,” he said.

One day, Loboa hopes, an injured patient will be admitted into a hospital, get a liposuction, and in a matter of weeks have a biomedical engineer create new tissue using stem cells from the patient's own fat.

“We're going full steam ahead on it,” she said. ■

## Pioneering research gives pets new legs



Family pets born without limbs will run and play just like other dogs and cats, thanks to first-of-its-kind research by NC State engineers and veterinary surgeons.

An engineering team led by Dr. Ola Harrysson, assistant professor of industrial and systems engineering, has developed state-of-the-art artificial implants that fuse with the animals' bones. This process, called osseointegration, is rare even in humans—the procedure has only been performed on several dozen people—and researchers hope the work on animals will lead to better prosthetics for people who were born without limbs or lost them in combat.

Dr. Denis Marcellin-Little, professor of veterinary medicine at NC State, attached an implant to a cat's leg in December, and more surgeries are scheduled for the first part of 2008.

“A large number of projects have been carried out as collaborations and today we can custom design, fabricate and implant different types of implants and osseointegrated prosthetics,” Harrysson said. “The research is very multidisciplinary and without the collaboration it would never happen.”

# Volunteer program sends alumni into classrooms

Engineering grads bring their  
knowledge to schools.



Dr. Laura Bottomley brings engineering into North Carolina's schools.

Taking engineering into North Carolina's schools has been the focus for Dr. Laura Bottomley for more than a decade. As director of K-12 Outreach Programs for the College of Engineering, she reaches more than 5,000 students, 200 teachers and 500 parents each year.

The success of the outreach programs has led to such great demand from teachers that it has exceeded the College's resources. That's when Bottomley decided to ask for help from the alumni community.

"We were maxed out, and we couldn't meet the demand," Bottomley said. "The alumni are a powerful tool for us to expand our reach."

Bottomley scheduled a series of recruiting sessions for alumni who were interested in volunteering. About a dozen alumni attended each session.

"We got a very good response," she said, "and we hope to make it an even wider response next year."

But sheer enthusiasm alone wasn't going to be enough to prepare the alumni for the job.

"The knowledge of what a K-12 classroom is like these days is important (for alumni)," she said, "and they need to have ideas of what they're going to do when they get there, so we came up with the training program."

Bottomley said that the training sessions were designed to show the volunteers how to connect with kids and how to make a presentation that would appeal to a wide variety of students. Plans are also underway for an online training video that would allow volunteers to complete the training on their own time.

In the future, Bottomley says she hopes to expand the alumni volunteer program across the state.

"It would be nice to have a cadre of alumni across the state who are enthusiastic and ready to go, because if I got a call from Murphy, I can't go to Murphy myself, but I would be able to call the alumni there and ask them if they could go. I think that would send a strong message about our university." ■



# Career Fair provides opportunities for students, employers

With so many College of Engineering students about to make the leap into the real world, it was no coincidence that more than 300 companies and government organizations from across the country convened at the McKimmon Center in February, hoping to get a chance to meet with the future graduates.

The Spring 2008 Engineering Career Fair took place February 7-8, making it the first time in the history of the event that it covered more than one day. The career fair is among the largest of its kind in the country.

Brian Koehler, who directs the event and coordinates the college's First Year Engineering Program, said that adding the second day was a step the College had to take to meet the demand from employers, and it has already allowed for tremendous growth for the event. More than 330 employers registered to participate in the spring event, while the fall career fair featured 190 companies.

The next event, to be held this fall, will also take place over two days, Koehler said.

"There is so much demand ... that we wanted to stop turning companies away based on the 190-company capacity of the McKimmon Center," Koehler said.

The popularity of the event has already spread beyond North Carolina's borders. Koehler said the fall event drew engineering students from Iowa, Georgia, Texas and New York. ■

Major employers such as Intel Corp. courted NC State engineering students at the Fall 2007 Career Fair.



## Volunteer opportunities

**This is your chance to make a difference in the lives of future NC State engineers or newly graduated ones. Groups and individuals who benefit from volunteer efforts include Admissions, the Career Center, Alumni Relations, engineering student organizations and current and future students.**

**To learn more about these opportunities, please email David Mainella at [david\\_mainella@ncsu.edu](mailto:david_mainella@ncsu.edu) or call 919.515.9957.**

**[www.engr.ncsu.edu/ncf/forms/volunteer.php](http://www.engr.ncsu.edu/ncf/forms/volunteer.php)**

## FACULTY spotlight

### Carbonell to lead Golden LEAF BTEC



Ruben Carbonell

Dr. Ruben Carbonell, the Frank Hawkins Kenan Distinguished Professor of Chemical and Biomolecular Engineering, has been appointed director of the Golden LEAF Biomanufacturing Training and Education Center (BTEC). Carbonell succeeds the founding director, Dr. Peter Kilpatrick, who has been named dean of the College of Engineering at Notre Dame University.

Carbonell will continue to direct the William R. Kenan, Jr. Institute for Engineering, Technology and Science; he has directed the institute since 1999. In this capacity, he led the establishment of the highly successful Kenan Fellows for Curriculum and Leadership Program, which has become a national model for university and industry K-12 outreach. Carbonell has also co-directed the NSF Science and Technology Center for Environmentally Responsible Solvents and Processes. He joined the NC State faculty as a full professor in 1984.

Located on NC State's Centennial Campus, the Golden LEAF BTEC is the largest facility of its kind in the nation.

### Saving energy: A look back at Jayant Baliga's invention



Jayant Baliga

We all wonder what we will leave as a legacy, and in the 21st century we also wonder about our carbon footprint.

For Dr. Jayant Baliga, the answers are obvious.

Baliga, Distinguished University Professor of Electrical Engineering, developed the insulated gate bipolar transistor (IGBT) in the late 1970s while working at General

Electric's research laboratory. The IGBT outgrew its initial use in HVAC units and can be found today in a large variety of consumer, medical and industrial applications.

The result of this widespread use is greater efficiency, translating to savings for consumers, industries and the environment. Traditionally, induction motors ran at a fixed frequency with dampers to regulate the load, resulting in large amounts of energy being wasted in the form of heat. Variable frequency drives enabled by the IGBT produce energy savings of 2.1 quadrillion BTUs annually.

These energy savings eliminate the need for 70 coal-fired power plants and the release of about 800 billion pounds of carbon dioxide every year, making it an important invention for fighting pollution and global warming.

## Johnson wins DARPA Young Faculty Award



Mark Johnson

Dr. Mark Johnson, assistant professor of materials science and engineering, was one of 24 researchers from universities across the country to receive the Defense Advanced Research Projects Agency (DARPA) Young Faculty Award.

The award program was designed by DARPA to identify the “rising stars” working in the field of microsystems technology.

Johnson received the award for his project entitled “Demonstration of Epitaxial MOS for Nitride Semiconductors.” His project was selected following a competitive three-part selection process that narrowed down the applicants from a field of approximately 150 to the eventual 24 award winners. Along with the award itself, Johnson and his fellow award winners will receive a research grant of about \$150,000 each from DARPA to help them as they continue to develop and validate their research project. Johnson received his Ph.D. from NC State in 1999.

## Turinsky receives RJ Reynolds Award for Excellence



Paul Turinsky

Dr. Paul J. Turinsky, professor of nuclear engineering, has received the R.J. Reynolds Tobacco Company Award for Excellence in Teaching, Research and Extension.

The award was established in 1981 to honor a member of the engineering faculty who has demonstrated superiority in several areas of activity that relate to the university's missions of teaching,

research and extension. The annual award is supported by the R.J. Reynolds Tobacco Company through the NC State Engineering Foundation, Inc. to bring recognition to scientific and educational achievements in engineering fields. The recipient is given a \$25,000 prize distributed over five years.

An internationally known researcher in nuclear fuel cycle analysis, Turinsky has published close to 300 peer-reviewed papers in addition to numerous review articles and book chapters. He is co-founder of NC State's Electric Power Research Center, which is responsible for the codes used by the nuclear power industry.

His other honors include the E.O. Lawrence Award in Atomic Energy in the area of nuclear technology from the U.S. Department of Energy in 2002 and the Eugene P. Wigner Reactor Physics Award from the American Nuclear Society in 2003.





Engineering Building II





## From the executive director



Ben Hughes

Dear Alumni and Friends,

Through the combined effort of the NC State Engineering Foundation Board of Directors and staff, the College of Engineering continues to drive toward a strong finish to the university's *Achieve!* Campaign. This initiative has been an overwhelming success, surpassing the goal to raise \$225 million before the end of the campaign. We cannot thank you enough for the vital contributions you have made during

this important effort. While we celebrate this shared accomplishment, we must also renew our commitment to continue building the endowment, particularly in support of undergraduate scholarships, graduate student fellowships and endowed professorships.

Support for faculty in particular is integral to the Dean's vision. We are therefore excited to share with you news of an important recent campaign gift of \$1.25 million from the Duke Energy Foundation. This endowment establishes two named, distinguished professorships and supports K-12 outreach efforts.

Outreach is vitally important. In today's global economy, building this pipeline is imperative to the competitiveness of our nation and the economic development of our state. That reality also guides the state's fundamental investments in the college. In February, Governor Mike Easley and House Speaker Joe Hackney spoke with great passion about increasing the size and quality of our facilities at the groundbreaking for Engineering Building III.

It also guides our alumni engagement strategy. In 2008 the Foundation rolled out new opportunities for alumni to volunteer in support of their college and for engineering as a profession. We provided outreach training to alumni and continued the Meet the Dean events, traveling to Chicago, Orlando and Tampa, and to Baxter Healthcare, SAS and Harris Corporation.

The Foundation also has enhanced communications, sending out news to some 15,000 alumni by email. We have developed and distributed a new flash video appeal that plays an important role in our annual giving strategy. That strategy seeks to build membership in the Dean's Circle, which provides crucial funding for freshman scholarships that help us compete for the best students.

Through all of these initiatives the NC State Engineering Foundation intends to realize the Dean's vision for the college, and each draws on the loyalty and commitment of our alumni and friends. Of all the advantages our college enjoys, that loyalty and commitment is most significant. Thank you very much for the ways that you contribute to the college, and in particular for your role in making the *Achieve!* Campaign successful. As we look to the increasingly important role NC State Engineering will play in the future, I hope that you will join us in renewing our commitment to grow the college's endowment.

— Ben Hughes  
Executive Director, Development and College Relations

## Volunteers

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The College of Engineering and the NC State Engineering Foundation Inc. gratefully acknowledge the generosity of our alumni and friends. Your loyal support is vital to the college and makes a tremendous impact on all facets of university life.

The list of donors can be viewed online at  
[www.engr.ncsu.edu/foundation/donors/](http://www.engr.ncsu.edu/foundation/donors/).

## Murray honored by alumni



Above: C. Richard Vaughn and Dr. Raymond L. Murray.

Below: Raymond Murray contributed to the design, construction and operation of the nation's first university-based nuclear reactor.

The history of the Department of Nuclear Engineering at NC State is the biography of Dr. Raymond L. Murray, Professor Emeritus in Nuclear Engineering.

In recognition of Murray's legacy in the department, C. Richard Vaughn, a 1961 graduate in nuclear engineering, has funded the renovation and naming of a laboratory in Murray's honor.

Thanks to Vaughn's gift, the radiation teaching lab in Burlington Engineering Laboratories has been fully repainted and has received new lights, blinds, and 10 new Dell computers with large flat-panel screens. The Dr. Raymond L. Murray Radiation Teaching Laboratory was dedicated Feb. 20.

Murray joined NC State's nuclear engineering program in 1950, contributing to the design, construction and operation of the nation's first university-based nuclear reactor. He led the nuclear engineering department from 1963 to 1974 and celebrated his 50th anniversary with the department in 2000.

Vaughn, a former student of Murray, has particularly fond memories of his professor because of the way he made complex course material interesting and understandable.

"I doubt that I could correctly tell you the name of any instructor or professor I had during my State career other than Dr. Murray," Vaughn said. "I can remember attending his classes almost as if they were yesterday."

Other former students have fond memories of Murray, too. Four nuclear engineering alumni—Norman Banks, G. Lansing Blackshaw, Thomas Hiron and Wilson "Bill" Leggett—have banded together to raise money for endowments that honor Murray and Wesley Doggett, another beloved educator who retired in 1993 as Professor Emeritus in Physics.

The Raymond L. Murray Engineering Scholarship provides two scholarships annually for undergraduates in nuclear engineering.

"We just had a such a strong attachment to Professor Murray and Professor Doggett," Banks said. "They contributed heavily to our careers. So we just wanted to give a little back." ■



Engineering Entrepreneurs Program students visited companies such as Google and Facebook during trip.



## Silicon Valley Trip brings together entrepreneurial alumni, students

They are the iPod Pioneers, the Sultans of Search, the Swamis of Social Networking.

They are Silicon Valley entrepreneurs, and NC State engineering and business students spent spring break learning about what makes them tick. The students headed to California's Bay Area as part of the Engineering Entrepreneurs Program (EEP), which immerses students in a business environment where they roll out startup companies and products. Visits to Apple, Google and Facebook were part of this year's itinerary.

The College's Silicon Valley-based alumni talked about their successes, but they mentioned their failures, too. Many alumni spoke about the long hours and frustrating moments that preceded their ultimate successes.

"Just being able to remember what they've struggled with and what they've gone through will help me in my future," said Jennifer Webster, a junior in electrical and computer engineering.

The trip was led by Dr. Tom Miller, the EEP director who is a professor of electrical and computer engineering and vice provost for distance education and learning technology, and Dr. Stephen Walsh, a teaching associate professor of electrical and computer engineering and the program's entrepreneur-in-residence. Miller, who started the EEP program in 1993, has watched more than 450 students complete it.

"I'm an absolutely incredible fan of this program," said Tony Blevins, an industrial engineering alumnus and senior executive for Apple. "The quality of the students has just been so impressive, and each year it gets a little bit more impressive." ■



## Build the NC State Engineering alumni network

The College of Engineering recently created a group on LinkedIn, the professional networking site. LinkedIn is a way to network, ask questions, reconnect with classmates and help other alumni.

We encourage you to join the group and reach out to other NC State engineers. By building a stronger alumni network, we can help each other succeed and help the College of Engineering.

To join the group, please send an email to David Mainella at [david\\_mainella@ncsu.edu](mailto:david_mainella@ncsu.edu) or call 919.515.9957.

## Meet the Dean events continue

The College of Engineering thanks the gracious hosts of its “Meet the Dean” events, which continued this fall and winter.

On December 5, W.H. Clark Jr. and his wife, Callie Ann, hosted Dean Louis A. Martin-Vega and other guests in Chicago. W.H. Clark graduated from NC State in 1956 with a bachelor’s degree in industrial engineering.

On January 8, Dean Martin-Vega was hosted by Leonard and Geraldine Habas in the Orlando, Fla., area. Leonard Habas is a 1966 graduate of the College; he majored in electrical engineering. Another event was held in Tampa, Fla., on January 9.

As a follow-up to all the “Meet the Dean” events, Dean Martin-Vega shared his vision for the College in a video email.

The video included testimonials from alumni and current students. We hope you enjoyed learning more about what is planned for the College and the value our students see in their experience.

If you did not receive the video, contact Dave Mainella at [david\\_mainella@ncsu.edu](mailto:david_mainella@ncsu.edu). ■

## Thanks!

Special thanks to all the alumni who served as co-hosts for the Fall Student Recruiting Events.

We appreciate your willingness to help us recruit the best for the College of Engineering at NC State! ■

## Award recognizes outstanding alumni

Three outstanding graduates of the College of Engineering were named Distinguished Engineering Alumni for 2007. Seventy graduates have received the award since college established it in 1966.

The 2007 recipients were Raymond A. Bryan Jr. of Goldsboro; Wayne T. Day of Potomac, Md.; and F. Neal Hunter of Durham. The awards were presented in November at the Capital City Club in Raleigh.

The Distinguished Engineering Alumnus Award honors alumni whose accomplishments further their field and reflect favorably on the university.



Bryan received his bachelor’s degree in construction from NC State in 1953. He is chairman of T.A. Loving Company, known for its beautiful construction projects on the university’s campus, including the Park Alumni Center.



Day received his bachelor’s degree in chemical engineering from NC State in 1965. He began a 36-year career at John J. Kirlin, Inc., a Rockville, Md., mechanical contracting business, in 1970 and served as president and CEO from 1984 until his retirement in 2006.



Hunter earned his bachelor’s degree in mechanical engineering from NC State in 1984. He co-founded two Triangle-based lighting companies—Cree, Inc. and LED Lighting Fixtures, Inc. ■

# Angelo Scholarship benefits Forsyth students and the environment

In 1996, brothers William Edward (Bill) Angelo and Ernest James (Jim) Angelo Jr. established the Ernest J. and Ethel H. Angelo Memorial Scholarship in honor of their parents.

The scholarship benefits students who have been admitted to the College of Engineering and have expressed specific interest in environmental engineering and exhibit both academic merit and financial need. The recipient must be a resident of Forsyth County, North Carolina, where the founders of the scholarship were raised. The scholarship is renewable for up to four years and is valued at \$10,000, covering full tuition, fees, and room and board.

Jim received his B.S. degree in electrical engineering from NC State in 1939. Bill received his B.S. degree in chemical engineering from NC State in 1942. Bill worked most of his career in pharmaceutical manufacturing, while Jim spent most of his career in academia. The brothers have both been named Distinguished Engineering Alumni at NC State—Jim in 1998 and Bill in 2006—for their contributions to the field of engineering.

Those who are interested in supporting the scholarship may send a donation to the NC State Engineering Foundation. Please indicate that you would like to contribute to the Ernest J. and Ethel H. Angelo Memorial Scholarship. ■

## What does it take to create a scholarship?

Are you someone who wants to leave a legacy or help ensure that a student has the same opportunities that you did? If so, creating a scholarship may be something to consider.

Endowed scholarships are vital to the College of Engineering. They help us recruit outstanding students and allow our students to focus on their studies.

The minimum to establish an endowed scholarship is \$25,000 (payable over a five-year period). Gifts may be made by cash, securities or land. The payout for a scholarship (the amount awarded to the student) is 4 percent of the earnings from the endowment. The rest of the earnings each year are reinvested in the principal. A \$25,000 endowment would yield a \$1,000 annual scholarship; a \$100,000 endowment would yield a \$4,000 annual scholarship; and a \$250,000 endowment would yield a \$10,000 annual scholarship.

For context, expenses (tuition, room, board and books) for an in-state student at NC State for the 2007-2008 academic year are \$15,197.

For more information on how you can leave your legacy, contact David Mainella at [david\\_mainella@ncsu.edu](mailto:david_mainella@ncsu.edu) or by telephone at 919.515.9957.



## Alumnus pays for NYC trip



Students took in great views atop the George Washington Bridge.

NC State engineering students saw things few people ever see when they toured the George Washington Bridge this fall. The whirlwind, one-day trip was made possible by a generous alumnus.

The funding was supplied by Otis Crowder, president of Charlotte-based Crowder Construction Co. Crowder graduated from the College of Engineering in 1970 and is a longtime supporter.

“Who gets to go to the top of the tower of the George Washington Bridge?” said Dr. Vernon Matzen, the professor of civil, construction and environmental engineering who led the trip. “It was a once-in-a-lifetime experience.”

For more on the trip, including an audio interview with Matzen, please see the January edition of the College's E-Newsletter at <http://pursuantgroup.com/ncstate/coe/0108a.htm>.

## Day family establishes fellowship endowment

A distinguished alumnus and his family have established an endowment for graduate fellowships in the Department of Chemical and Biomolecular Engineering.

Wayne T. and Mary Grace Day endowed a gift of \$260,614 to the department in September. The gift will establish the Wayne T. Day Family Fellowship Fund.

“We are grateful for this generous gift from the Day family,” said Dr. Louis A. Martin-Vega, dean of the College of Engineering. “This endowment will help us continue building our chemical and biomolecular engineering program, which is already one of the best in the nation.”

Wayne Day graduated from NC State in 1965 with a bachelor's degree in chemical engineering. The football field at Carter-Finley Stadium was named the Wayne T. Day Family Field in recognition of his generous support of the university.

## College receives in-kind gifts

Several corporations have made generous in-kind gifts to the College.

Intel, IBM and NetApp made the donations to the Virtual Computing Lab (VCL), a first-of-its-kind computing development that is boosting the university's efforts to provide greater access to technology for the people of North Carolina.

Intel donated \$2.4 million in computer equipment to the next-generation computing system. IBM complemented the gift with a donation of about \$1.2 million, and NetApp provided a gift of storage.

Cisco Systems also made a significant donation, providing networking and wireless equipment valued at over \$540,000. The partnership will provide future generations of engineering students with hands-on learning experience with Cisco technology.

The Cisco donation includes four racks of new equipment to be used in a joint laboratory by students in the Department of Computer Science and the Department of Electrical and Computer Engineering.

## About the Engineering Foundation

The NC State Engineering Foundation Inc. (NCSEF) was organized in 1944 by area industrial and business leaders. The purpose of the foundation was to form a tax-exempt, non-profit organization to promote and receive monies to support the College of Engineering at North Carolina State University. The NCSEF is governed by a 32-member Board of Directors, which oversees more than \$53 million in assets. The Board, along with the foundation staff, also works to enhance the image and presence of NC State's College of Engineering.

## Show your support – make a gift to the College of Engineering

Your gift to the College of Engineering at North Carolina State University can support a variety of funds, programs and academic endeavors. These many opportunities to give can be tailored to your needs and interests. Giving to the college is the best way to support scholarships, fellowships, professorships, academic programs, faculty research and areas that are not supported with state funds. The College of Engineering appreciates your interest in its giving programs. If you would like more information, you can visit our website at [www.engr.ncsu.edu/foundation](http://www.engr.ncsu.edu/foundation) or you can contact us:

### NC State Engineering Foundation Inc.

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## The catalytic convergence

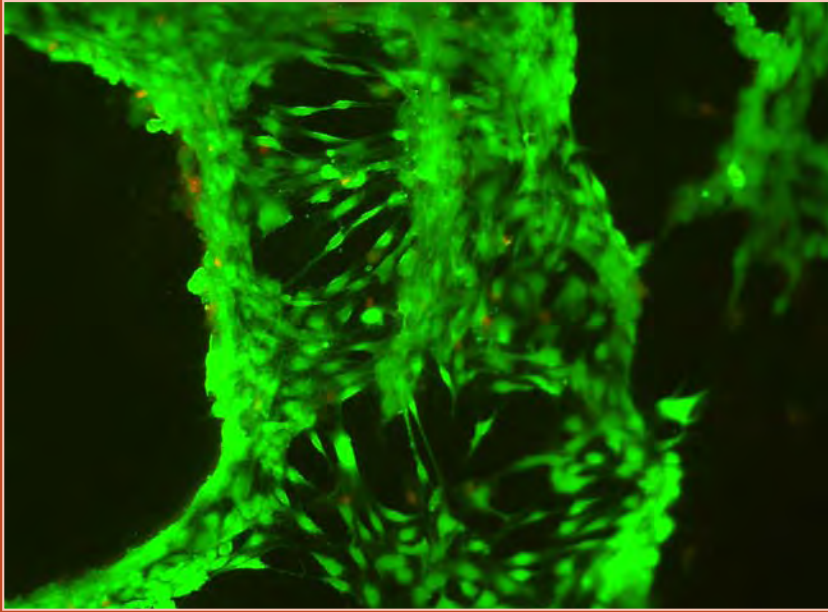
Ten years from now – when the students, faculty and staff of NC State's College of Engineering consider their college's remarkable ascent – this will be considered the moment in time when the college soared to seize its fullest potential. The propellers are these:

- Dr. Louis Martin-Vega, dean of engineering, arrived in the summer of 2006. Martin-Vega brings to the college an infectious enthusiasm for engineering, a deep appreciation of the college's rich history and a sharp vision for the limitless future of this place and its people.
- The continuing escalation in the talents and abilities possessed by students and faculty, two groups that inspire one another to achieve greatness in the realms of scholarship, research, outreach and innovation.
- The tipping point is the college's transition to Centennial Campus, a national model for seeding technological innovation through the convergence of university research, industry and government all within state-of-the-art facilities. Perhaps no other university setting nationwide so effectively encourages basic research to achieve real-world application.

To take fullest advantage of this moment and achieve our ambitious goals, additional support to build the college's endowment will be required from its stakeholders – the College of Engineering at NC State currently lags behind many of its peers in total endowment. In higher education, nothing is more important to the future than endowments, the building blocks for both institutional stability and innovation.

This is as true for public colleges as for private. Taxpayer funding now accounts for only 41 percent of the university's expenditures. Endowment provides flexibility where state funding falls short and allows the college to take advantage of emerging opportunities.

We invite you to become a catalyst for the college and participate in our shared, unlimited future.



## Building Bones

Dr. Elizabeth Lobo wants to give injured patients new bone and cartilage. She's starting with their own stem cells.

*(See Feature article on page 16.)*

Visit the College of Engineering at North Carolina State University on the Web:

**[www.engr.ncsu.edu](http://www.engr.ncsu.edu)**

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